

Regional Modeling – WRF/Chem

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Frost and others**

Regional Modeling – WRF/Chem

- Objectives
- What models
- Some early results (verification, inter-comparison, trajectories, cloud forecasts, etc...)

Objectives

- Improve next generation air quality forecast model
- Assist in field operations

Three different versions of WRF/Chem (“online”, meteorology and chemistry integrated together)

- WRFV1/chem (27km dx)
 - Has been running for close to two years with no or little change (96 emissions inventory), evaluated retroactively with data from NEAQS2002
- WRFV2/chem (12km dx)
 - Improved anthropogenic emissions input (99 inventory)
 - Different Soil/veg/snow scheme and coupling to PBL
 - Different convective parameterization
 - Meteorological analysis based on 3dvar RUC analysis - includes sophisticated cloud analysis

Three different versions of WRF/Chem

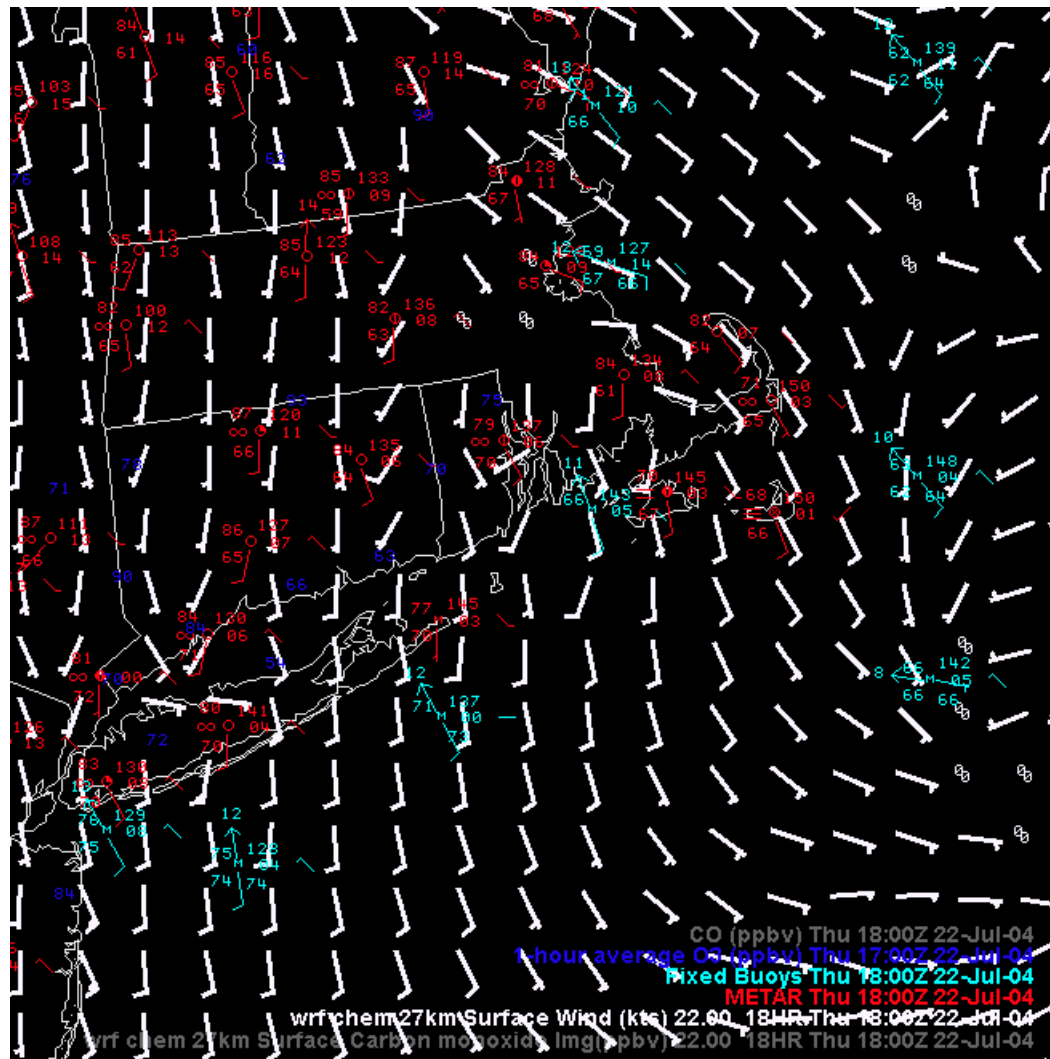
- WRFV2.2/chem (27km dx)
 - In addition to the previous, biogenic emissions have been changed and are now based on Beis3.1.1
 - Consistency between land use data and biogenic/anthropogenic emissions has been improved

What is available on WEB/FxNET

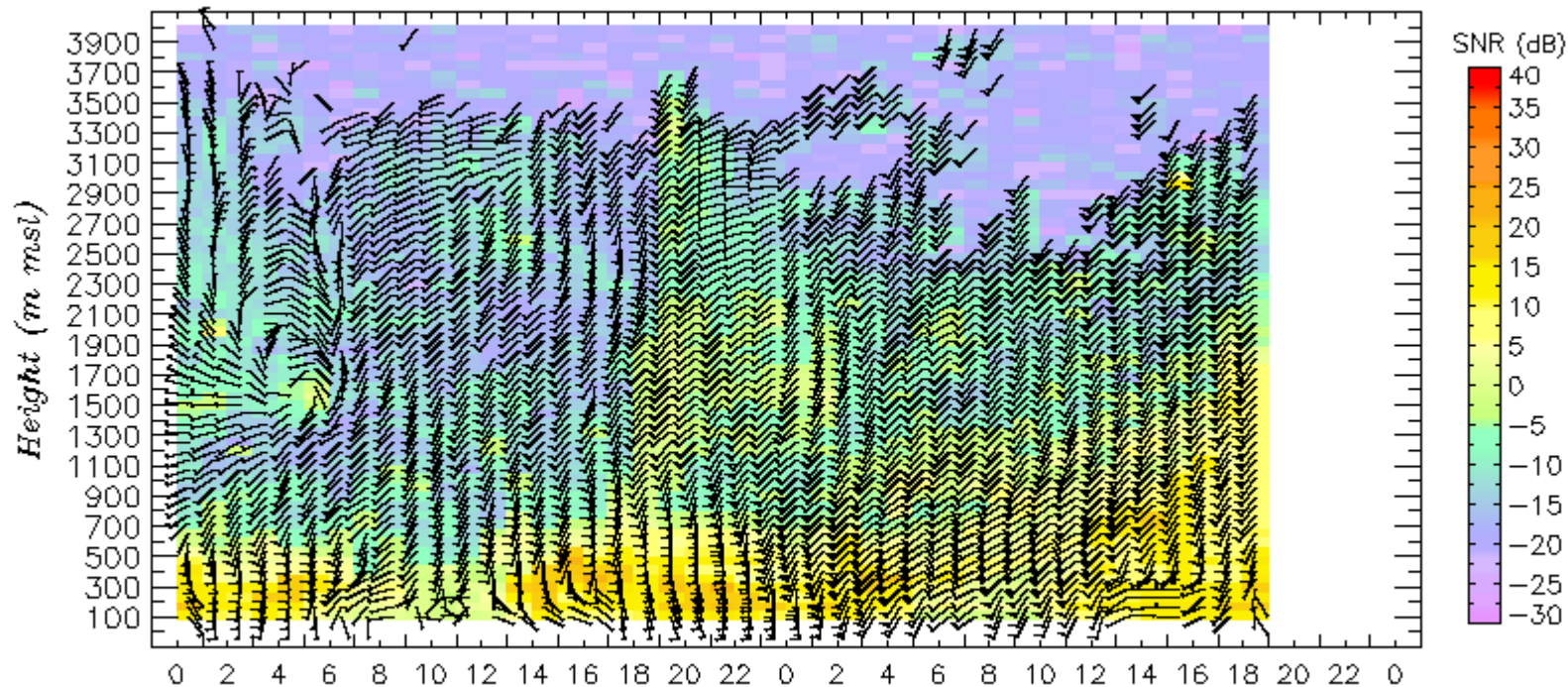
**After some initial problems with size of data sets
and different model versions**

- **WEB (O₃, PM, met stuff):**
 - WRFV1 (27km)
 - WRFV2 (12km)
 - All versions on ETL site
- **FxNET**
 - 72-h WRFV2.2 run (27km)
 - 36-h WRFV2 run (12km)

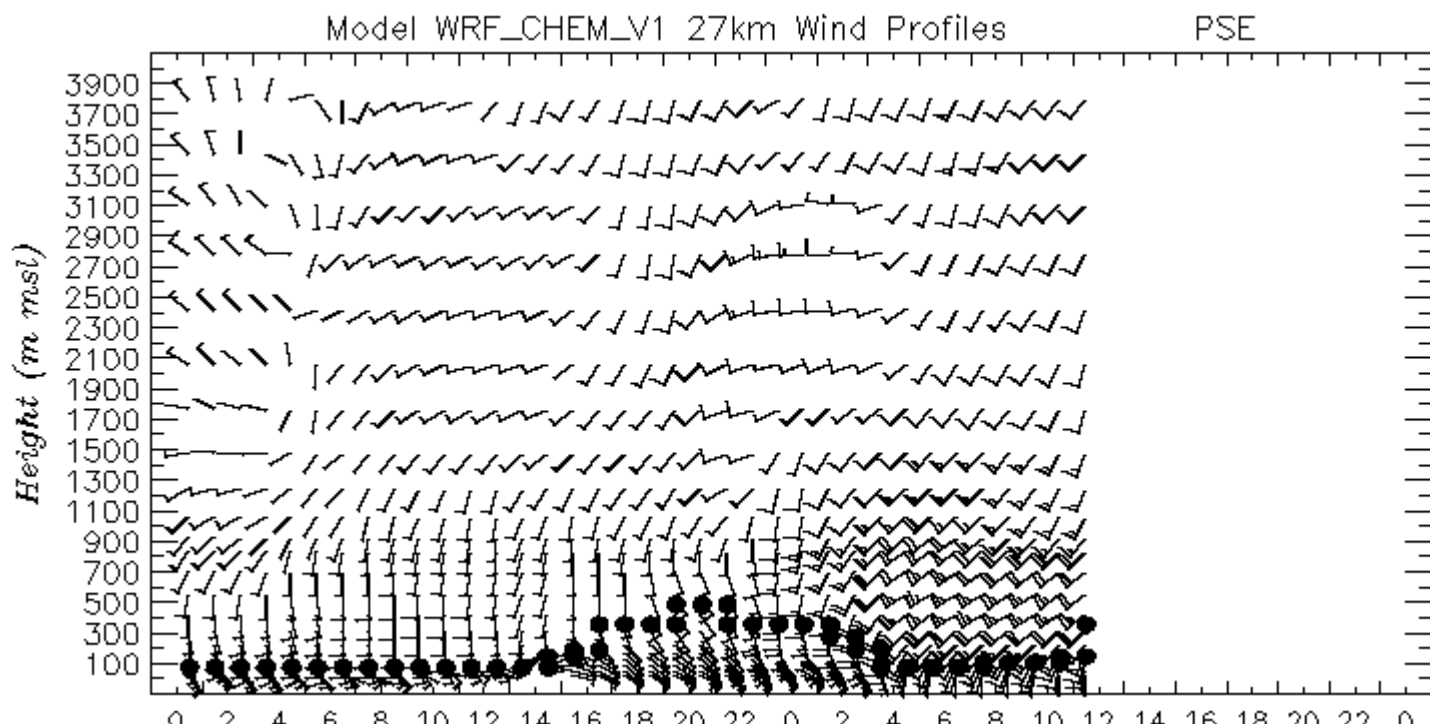
How well do the models predict the local wind fields?



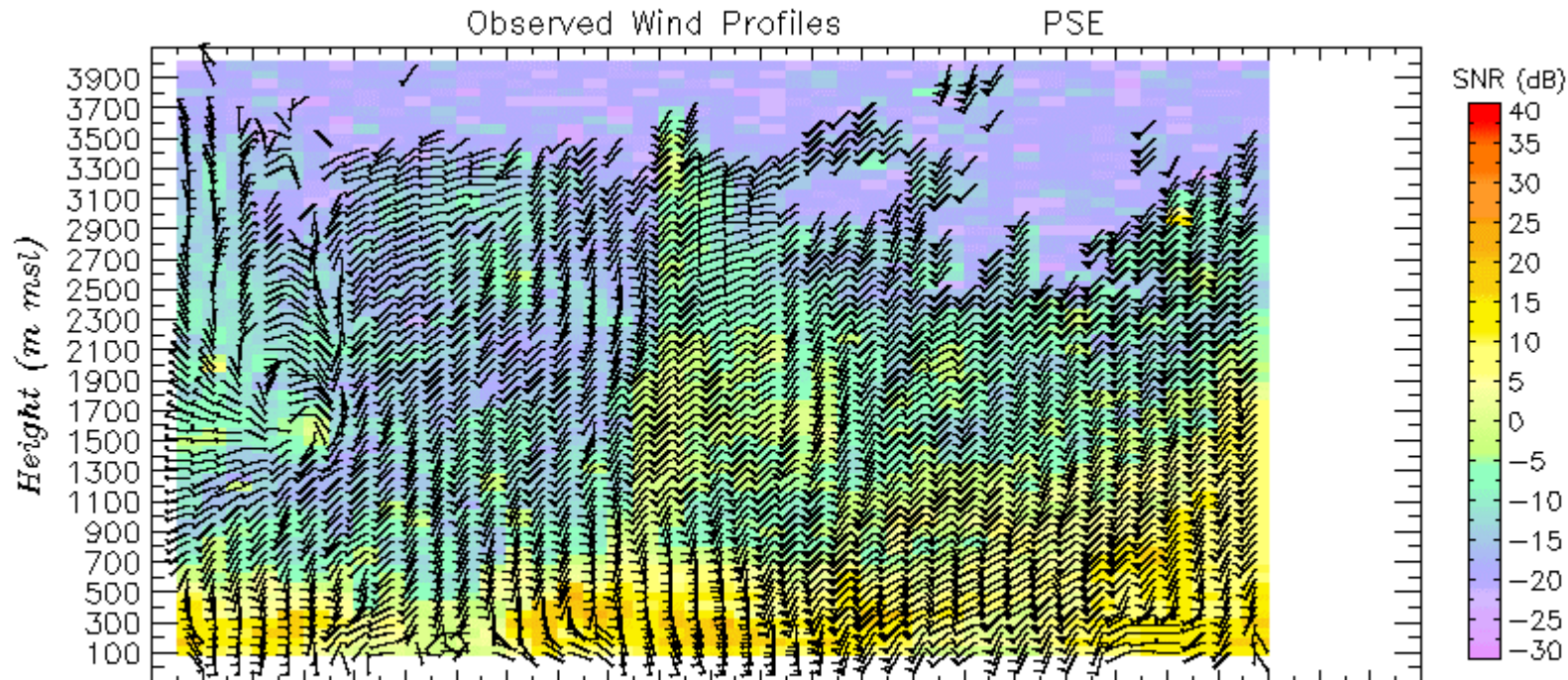
Observations



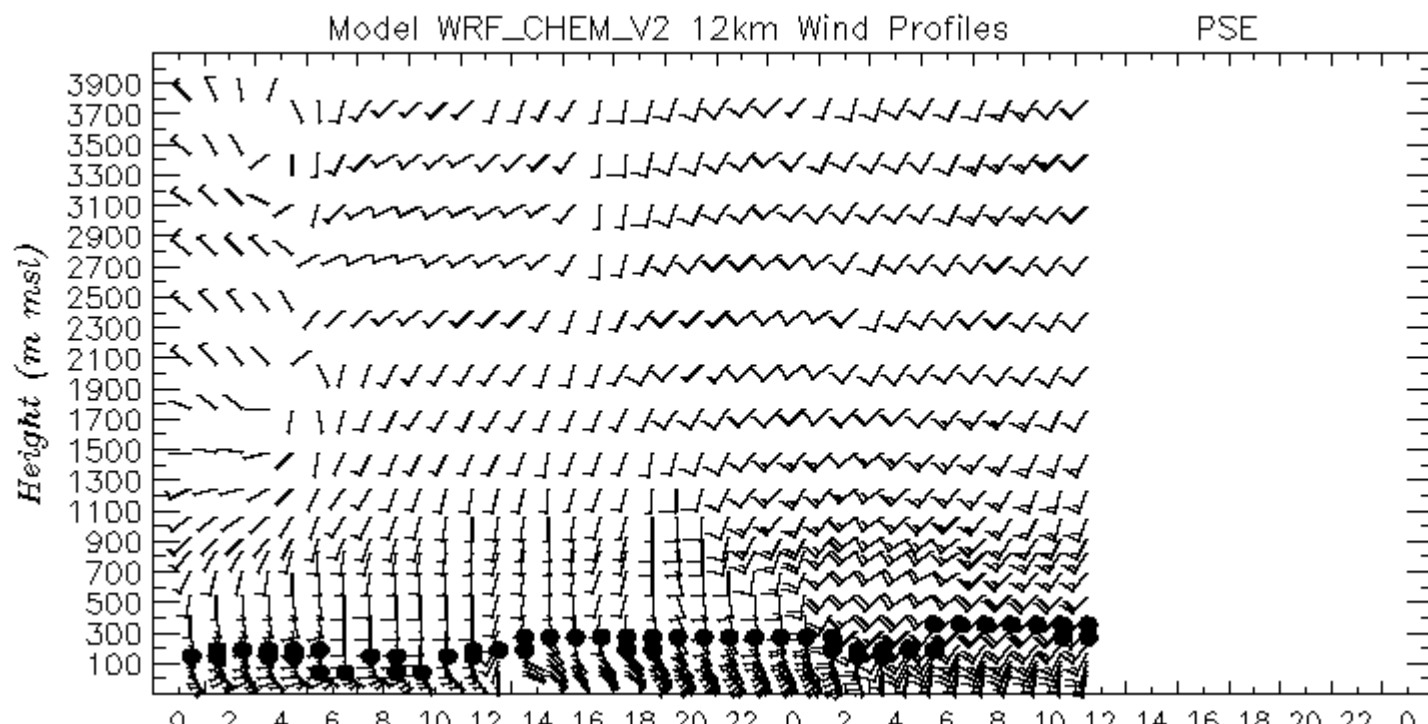
WRF1 - 27km



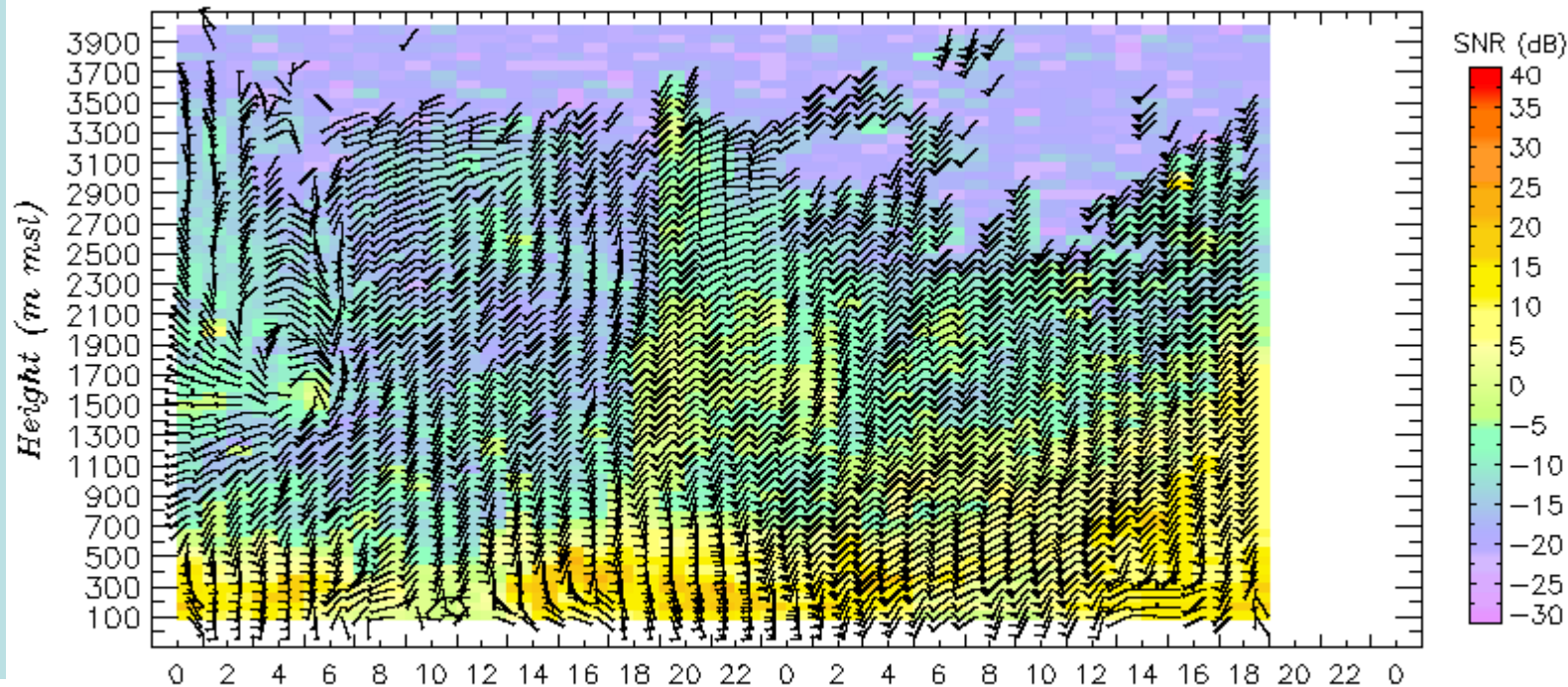
Observations



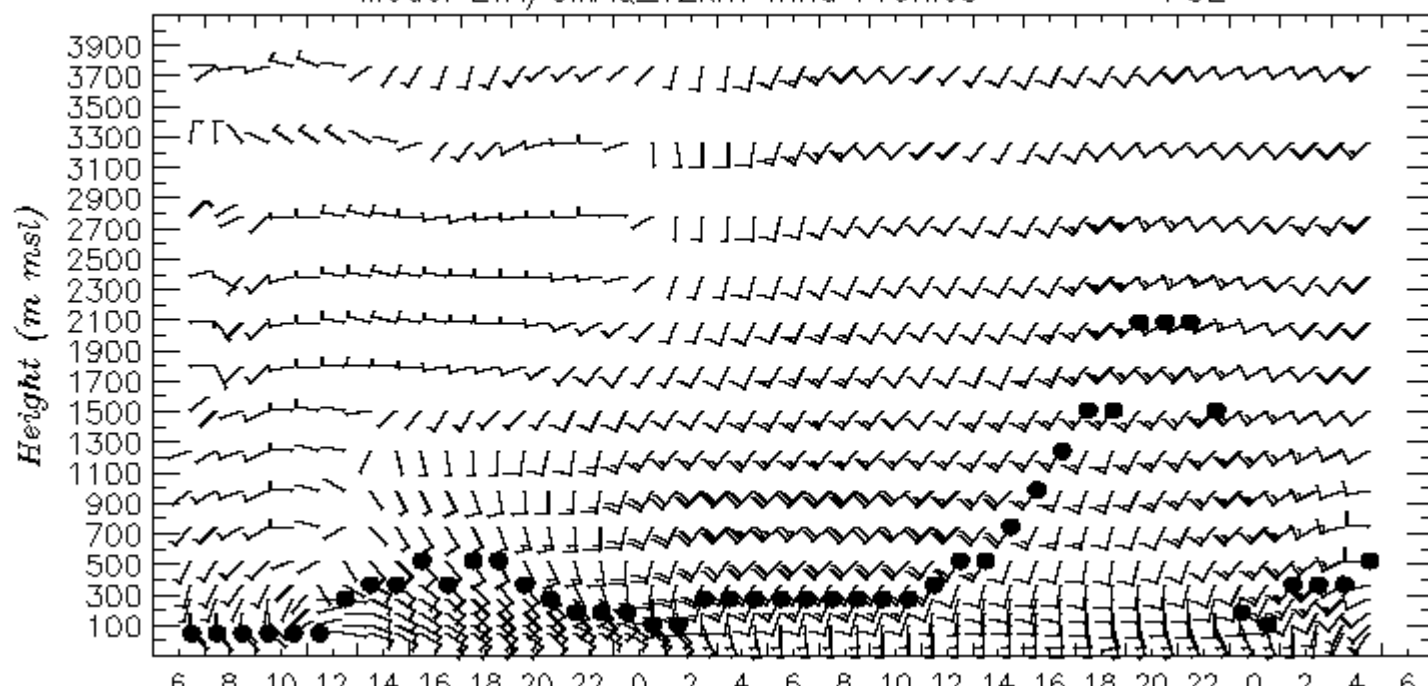
WRF2 - 12km



Observations

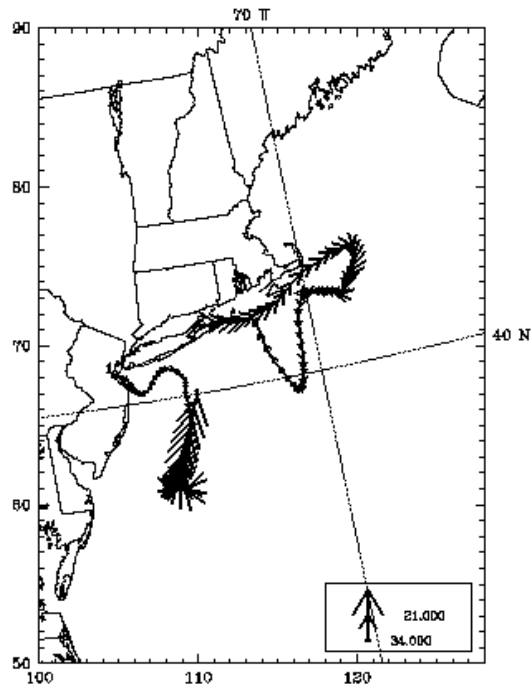


ETA/CMAQ



Trajectories: where does what plume go

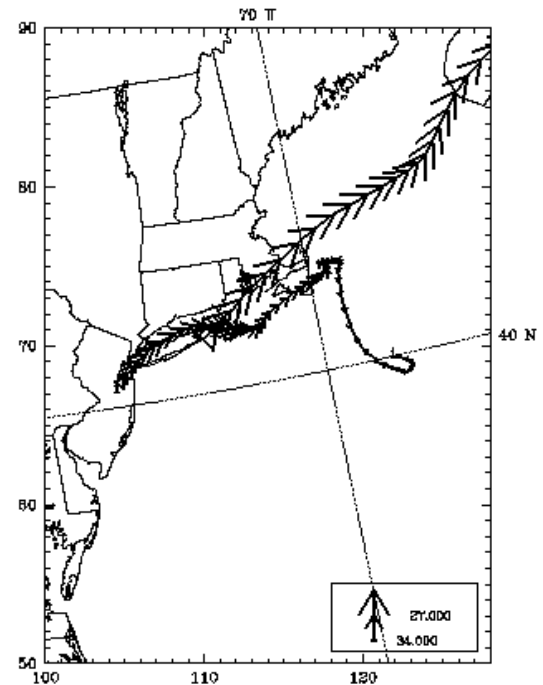
Morning plume, trajectory release at 12z



Model Info: V2.0.2

Mel-Yam-Ja NCEP mixed 27 km, 34 levels, 90 sec

Evening plume, trajectory release at 00z



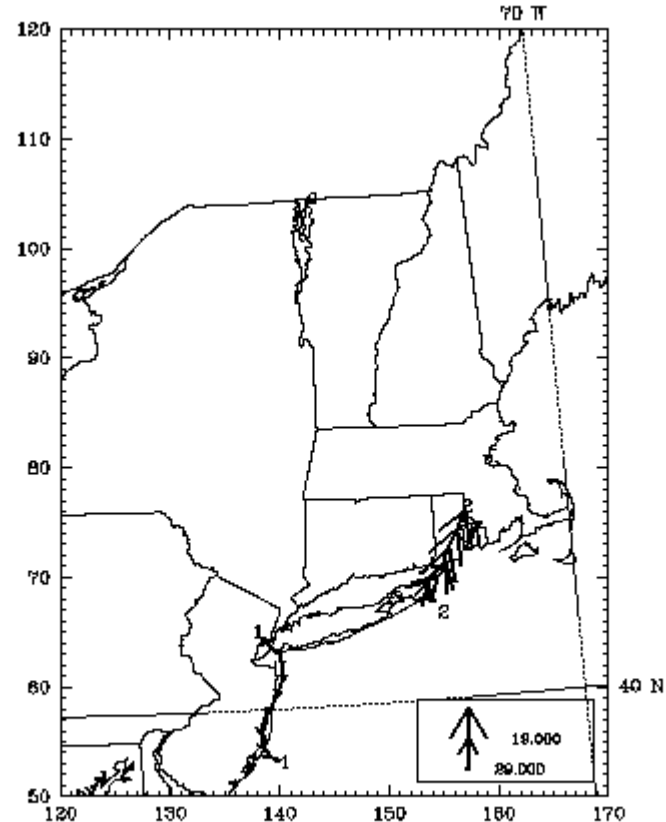
Model Info: V2.0.2

Mel-Yam-Ja NCEP mixed 27 km, 34 levels, 90 sec

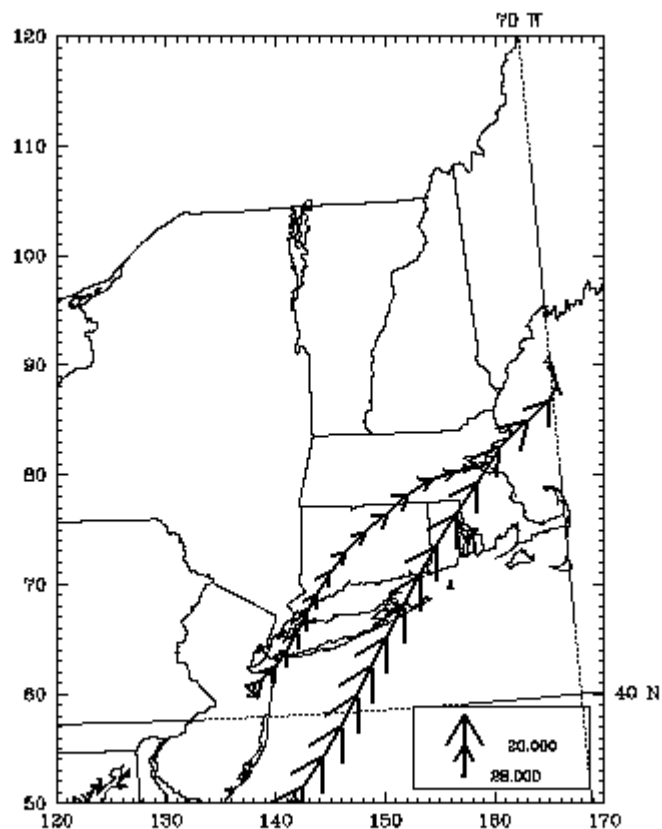
Forward trajectories

Trajectory: How does resolution influence results?

WRFV2 – 12KM, 12z
release



Backward trajectories: where did the air come from



Model Info: V2.0

Met-Yam-Ja NCEP mixed 12 km, 34 levels, 40 sec

level 1

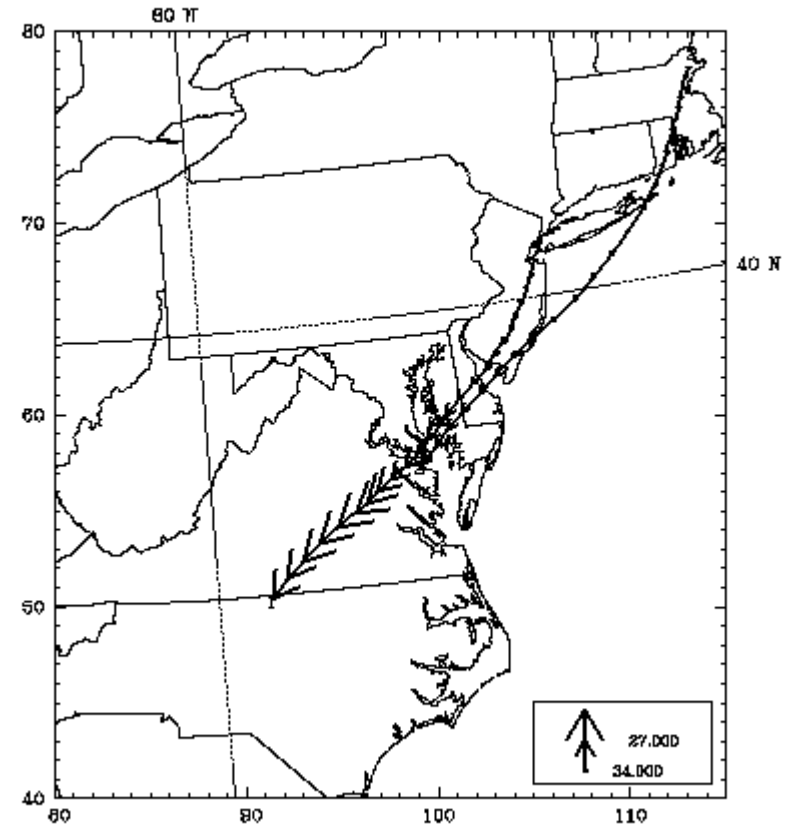
Fcst: 0.00

Trajectories from hour 48.000 to 72.000

Init: 0000 UTC Fri 23 Jul 04

Valid: 0000 UTC Fri 23 Jul 04 (1600 MDT Thu 22 Jul 04)

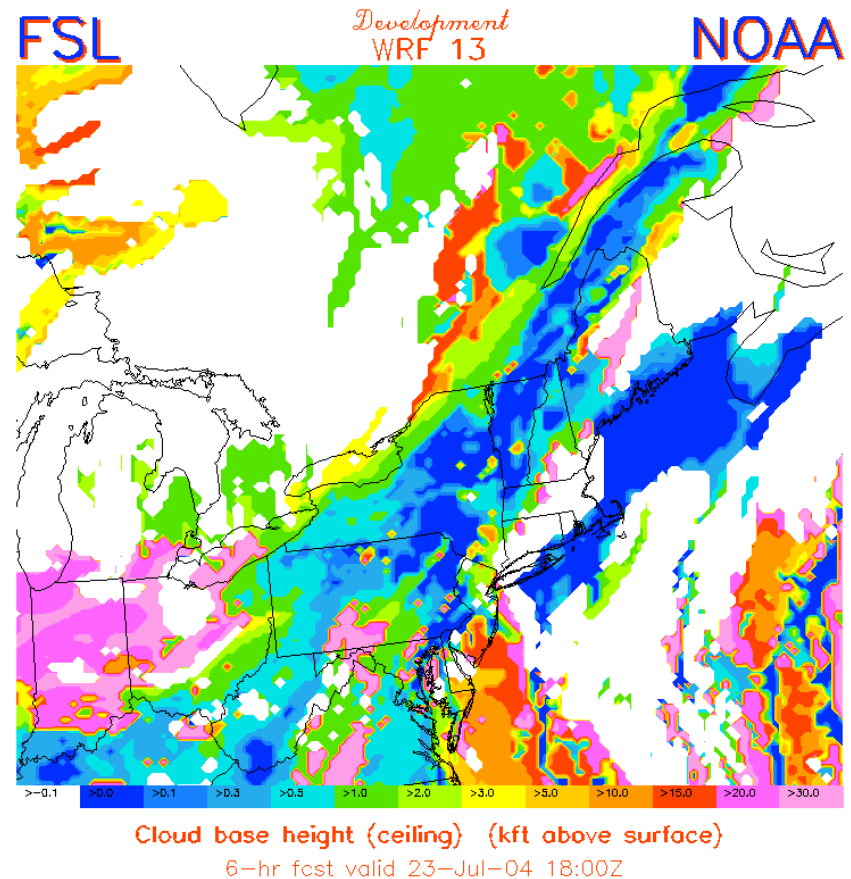
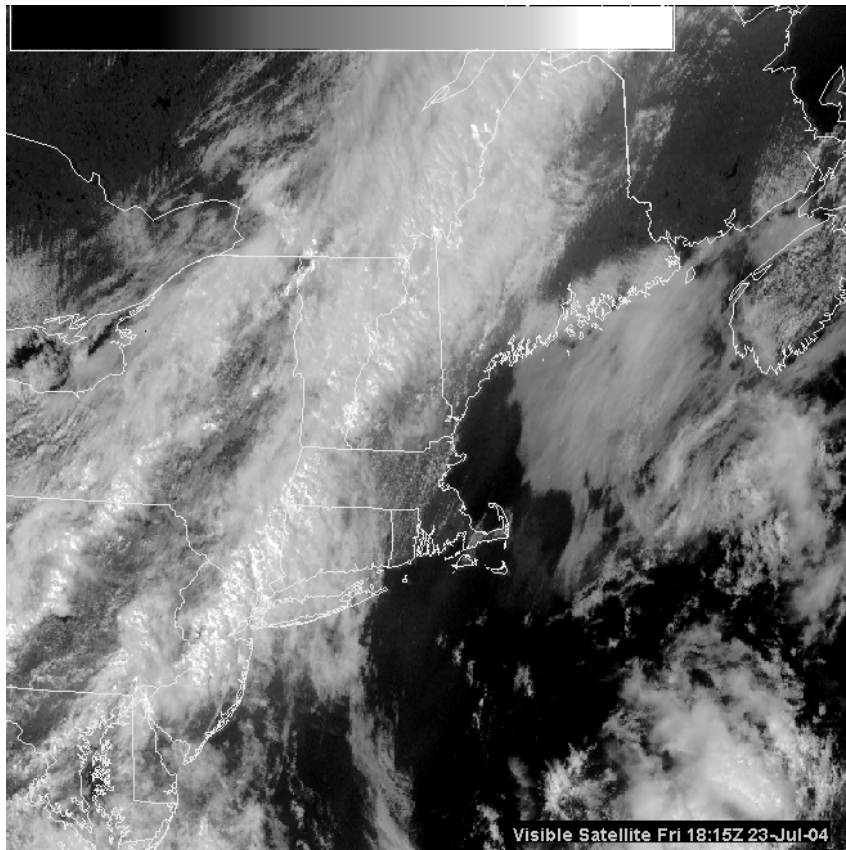
Time (h)	CO (PPM)	Prs (mb)
48.000	0.869	1020.045
51.000	0.487	1019.215
54.000	0.344	1018.626
57.000	0.239	1018.429
60.000	0.223	1014.085
63.000	0.198	1011.223
66.000	0.278	985.781
69.000	0.312	965.949
72.000	0.299	973.049



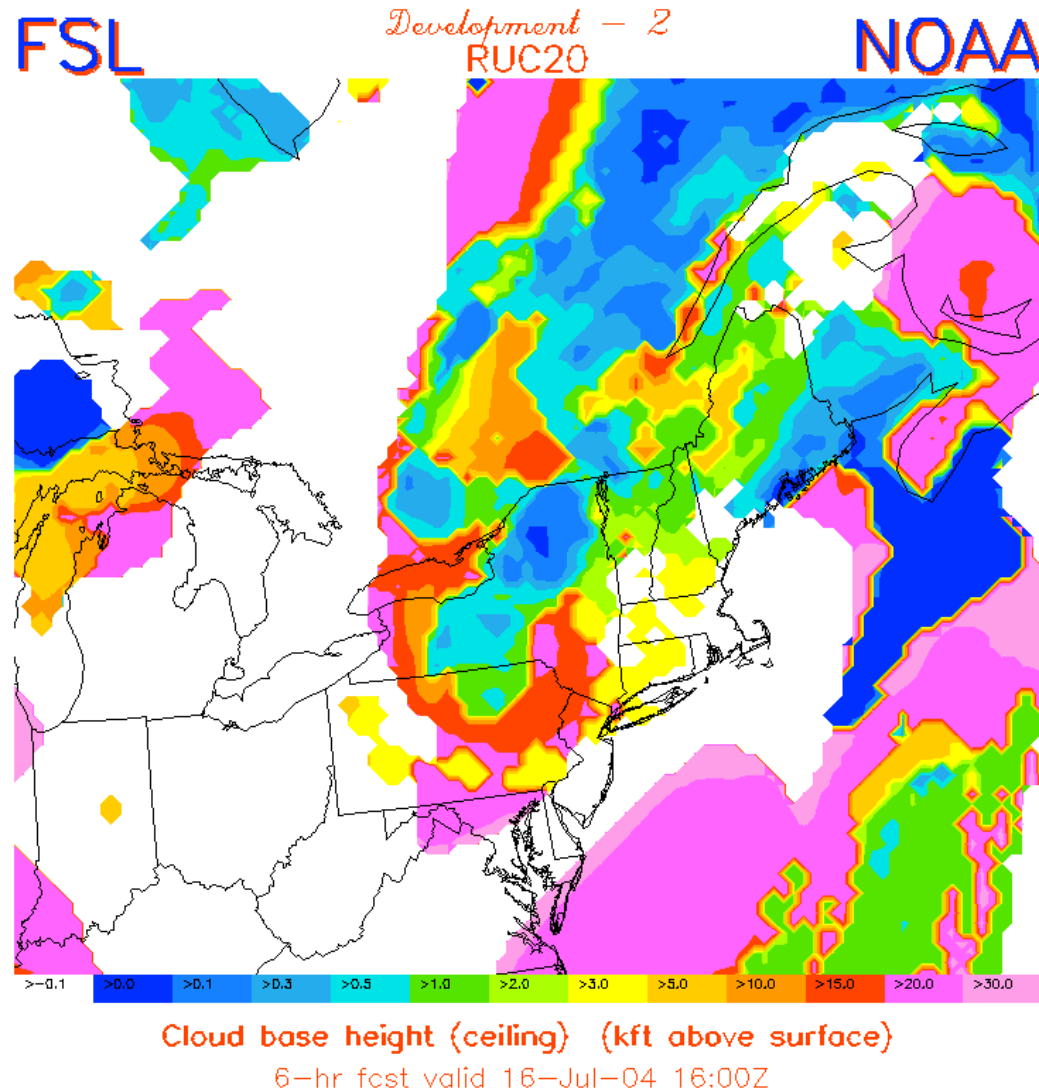
Model Info: V2.0.2

Met-Yam-Ja NCEP mixed 27 km, 34 levels, 90 sec

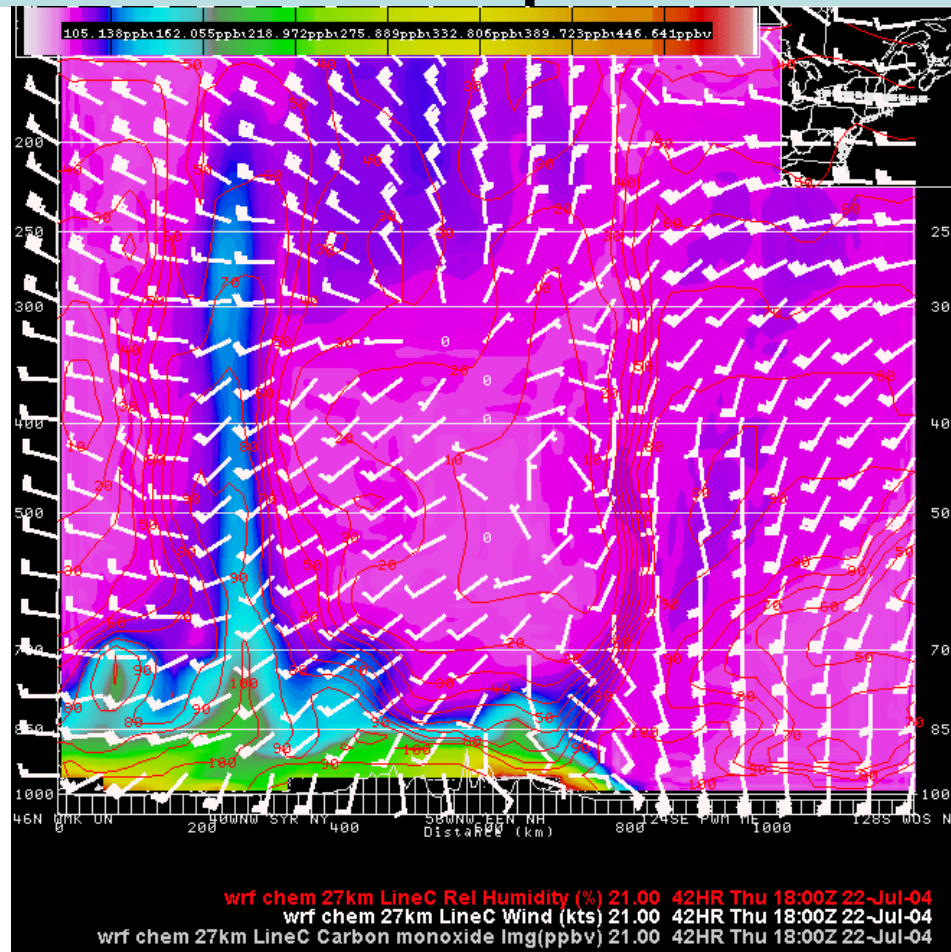
Suopport from RUC and WRF for cloud forecasts



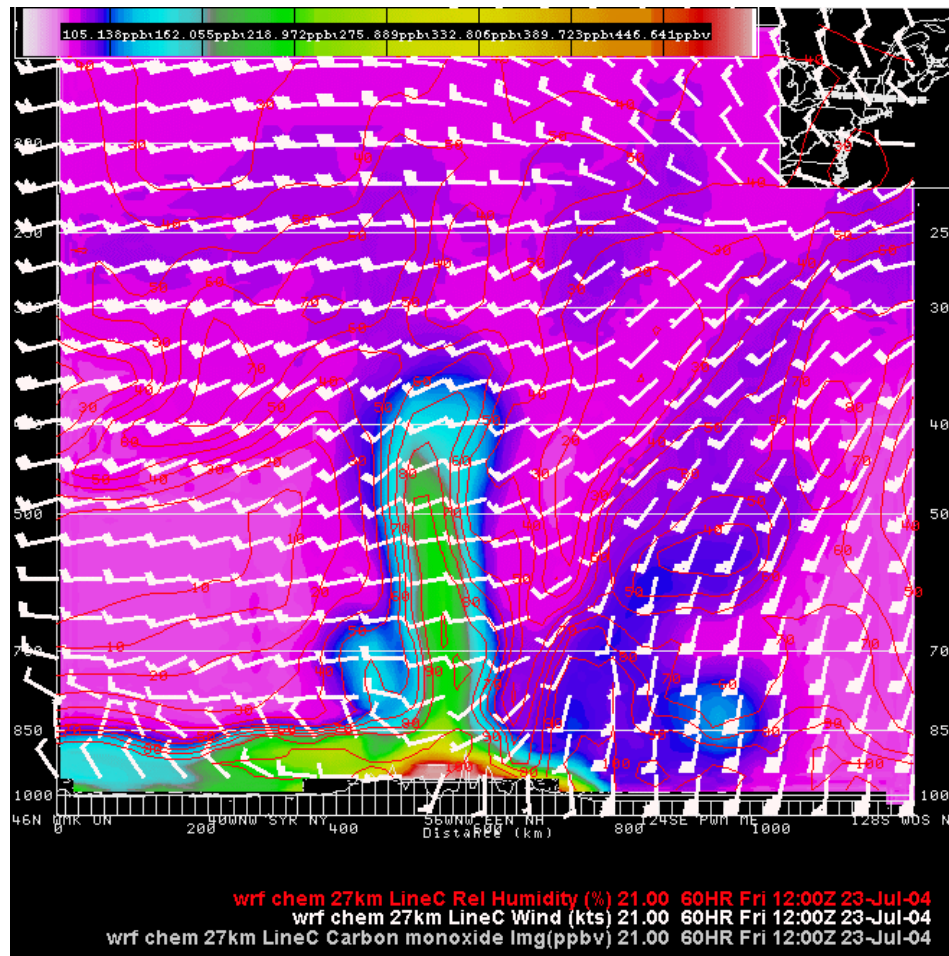
Suopport from RUC and WRF for cloud forecasts



Effect of Convection on pollutant transport

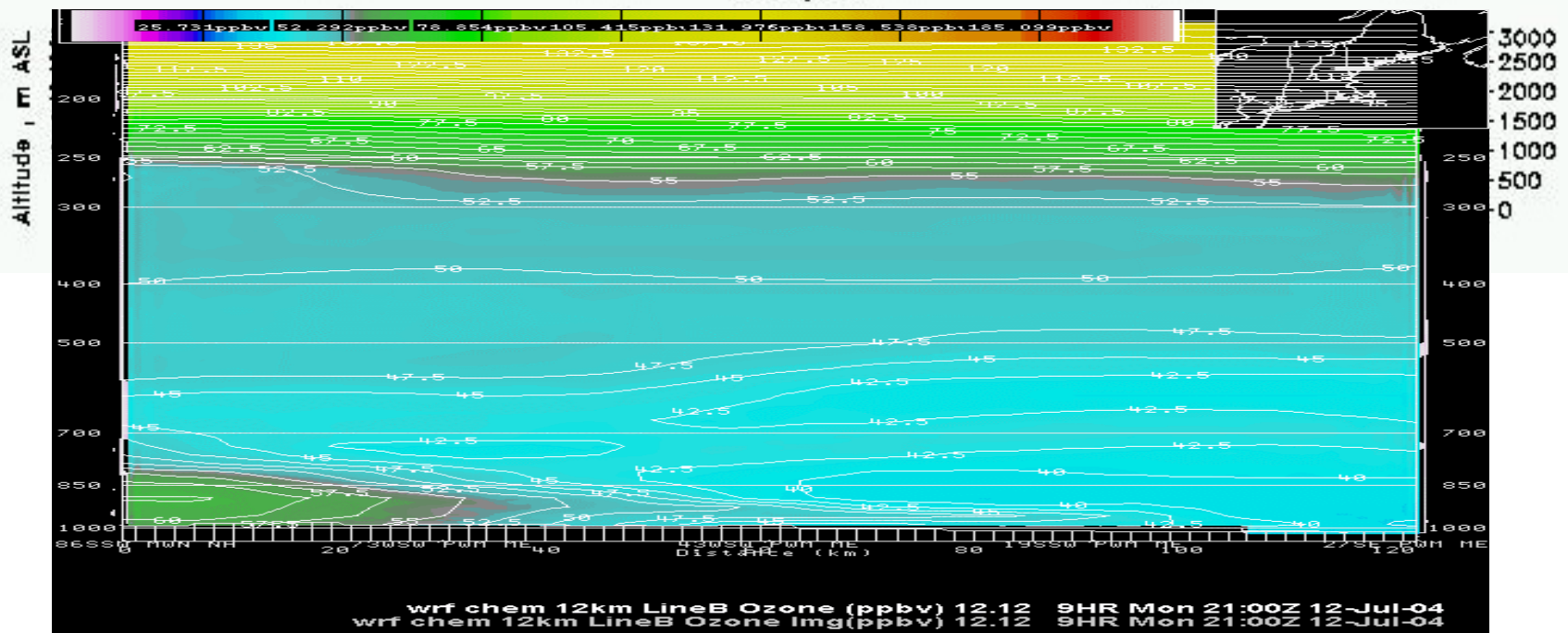
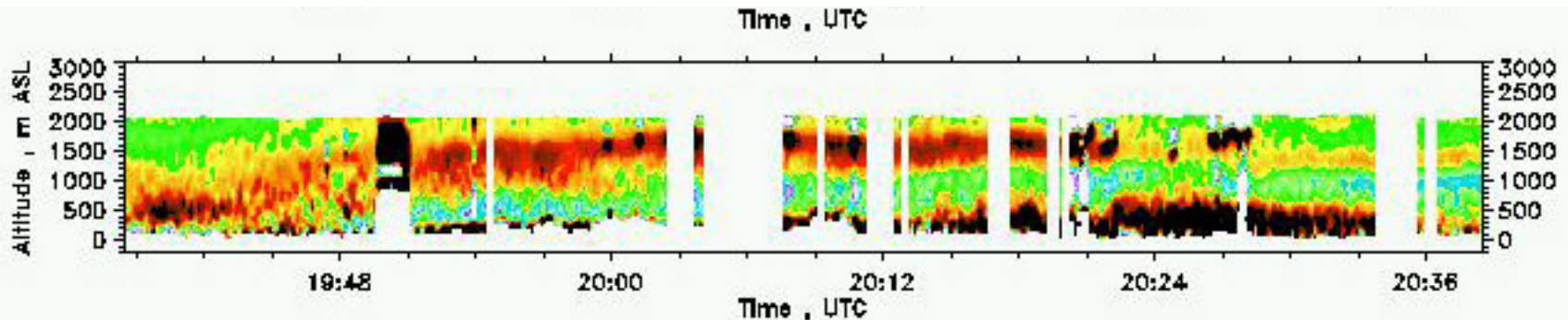


More convection and warm frontal lifting



Can it work?

ETL lidar and 12 July, 21Z WRF-CHEM



Isoprene prediction along P3

Flight path, NYC-1, 17z

